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The DoD Gateway Information System:

Operational Prototype and

Transition Period

1987-1988

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The Defense Technical Information Center (DTIC) has developed the DoD Gateway Information System (DGIS) as a means for the DoD Scientific and Technical Information (STI) community to access remote heterogeneous databases in a common simplified manner and analyze the information from these databases.

This paper explains the progress on developing and prototyping Phase I of DGIS during the 1987-1988 time period. The various components covered are the Directory of Resources, post-processing software, the GENIUS document ordering system, user support, SearchMAESTRO menu driven system and the Common Command Language effort. In addition, this paper covers the effort to transition DGIS from an operational prototype system to an operational system. A bibliography of DGIS-related papers is included.

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March 1989

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1. BACKGROUND

The Defense Technical Information Center (DTIC) has as part of its mission to aid in bringing scientific and technical information (STI) from many sources to the DoD Research, Development, Test and Evaluation (RDT&E) communities. One of DTIC's major development efforts in this area is the DoD Gateway Information System (DGIS). DTIC began the development leading to DGIS in 1982 as part of an interagency group including Department of Energy and National Aeronautics and Space Administration (NASA). The project used intelligent gateway software developed by Lawrence Livermore National Laboratory (LLNL) as a base. Later DGIS development continued through a contract to Control Data Corporation.
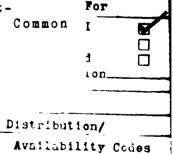
Intelligent gateway software is a method of connecting to heterogeneous remote resources from a central node. The data from that resource can be downloaded to the gateway, merged with data from other databases, then can be analyzed and duplicates eliminated. Finally the data can be formatted in a number of ways.

At the beginning of the Operational Prototype period, in Oct 87, DGIS was running on a VAX 11/780 under the 4.2 BSD UNIX operating system. A small user and development group had access to the prototype through direct dial or TYMNET. DGIS was using LLNL's Integrated Information System (IIS) as menu software and LLNL's original version of Process, its post-processing software. Connection agents had been created through LLNL's Network Access Machine (NAM) software.

This paper will explain the development efforts that were undertaken during the operational prototype period in terms of enhancing and stabilizing the software used for DGIS. In addition, during FY 88, much effort took place to plan for the transition of the system from DTIC's Office of Information Systems and Standards Division (DTIC-E) to the operational directorates Office of Telecommunications & ADP Systems (DTIC-Z) and Office of User Services (DTIC-B) who assumed responsibility for the operational version of DGIS in Oct 9.

2. COMPONENTS

DGIS, a large complex effort, was divided into several sub-efforts. These included the Directory of Resources, Post-processing software, GENIUS, User support, SearchMAESTRO, Common Command Language, and menus.

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2.1 Directory of Resources

Among the problems which DGIS addresses are the vast number of resources available in the Federal and commercial sectors and the lack of user knowledge about those resources. The Directory of Resources is an online database that describes over 800 Federal and commercial databases. It is searchable by subject, terms in the abstract, database name, database acronym, and responsible organizations. The Directory's retrieval and input systems were developed during 1988 using Relational Technology Incorporated (RTI's) Ingres database management system. Creation of the Directory's retrieval system was difficult because the requirement was for full text searching of fields which contained more than 2000 characters. Ingres, like most relational database management systems, is not set up to allow large text fields or to search efficiently for single words within a larger field. Therefore many work-arounds were required. However this extra effort was balanced by the relational database's ability to handle more than one file at once, its potential to support a distributed database over multiple types of computers, and its integration with standard UNIX conventions, tools and support.

2.2 Post-processing

The post-processing routines allow downloaded files of bibliographic citations to be transferred into a standard format. Once the files are in the same format, the routines eliminate duplicates, merge files, sort citations, analyze information and format a final product as specified by the user.

The post-processing software is the Process software which DTIC and other sponsors funded LLNL to develop. The original version of the "process" software was installed on DTIC's computer in 1986. During 1987 and 1988, DTIC funded LLNL to streamline and stabilize the software, as well as add several user-requested enhancements. A programmer's manual and a user's manual were developed. Among the enhancements to the software were improved handling of upper and lower case text, increased accuracy of the reformatting processors for specific databases, and vastly enhanced formatting capabilities. An automated method of creating new translators for database formats was also delivered.

The second version of the post-processing software was installed on DGIS in 1988. The routines had to be integrated into the current DGIS menus. This was performed by DTIC contractors and was difficult because LLNL preferred to develop post processing outside the DGIS menus environment. Therefore DTIC had to modify their work with each new delivery of the software. DTIC has since ceased to fund software development through LLNL. Further developments to the DGIS post-processing software will take place through DTIC contracts.

be useful for fast questions and emergencies. The DGIS "link" command allows two DGIS users to see simultaneously the same session online. GUSTO can use "link" to show a remote user exactly how to use the system.

GUSTO served as a central collection point for user questions. They presented statistics each month to DTIC which showed the numbers of questions answered and the areas in which users required help. Through surveys of users, experience and response forms at training courses and hotline support, GUSTO was able to pinpoint areas in which the software needed enhancement, and areas in which the documentation needed improvement.

2.5 SearchMAESTRO

SearchMAESTRO is a tailored menu-driven interface to over 800 databases. Although it is a separate system that can be accessed without DGIS, SearchMAESTRO is also the end-user interface for DGIS (compared to the command-driven interface for intermediaries). Novice searchers appreciate the system's ability to help them select a database and retrieve citations easily. On the other hand, experienced searchers easily become impatient at SearchMAESTRO's menus and prompts - they want the flexibility of being able to set the criteria themselves. During this period, the SearchMAESTRO menus were reorganized and DROLS Technical Report Database and Work Unit Information System interfaces were established. An interactive help function to a DROLS expert and an automatic scan of government sponsored research databases were also installed during the prototype period.

2.6. Common Command Language .

Since all the Federal and commercial database systems were created in isolation, each has a different method to log on, log off, search the database, etc.

The Common Command Language (CCL) is the DGIS interface for users who want the flexibility of a command language but do not want to learn the intricacies of every database's language. The CCL is being created using artificial intelligence techniques and the Prolog language. It employs the National Information Standards Organization (NISO) Common Command Language Standard.

The CCL project was not part of the DGIS operational prototype. It is scheduled to be completed Oct 89. Other papers describe CCL's intentions and progress. (See Bibliography).

2.3 GENIUS (General Information on Demand User Services)

DGIS was established to aid its users in gaining access to information from many sources. Up to this time, DGIS had centered on searching citation-based bibliographic databases and analyzing the results. However, the next step in the information-seeking process was not covered, that is, gaining access to the information itself. For this reason, the GENIUS subsystem was developed.

GENIUS is a series of screens which allow users to order any type of document - technical reports, books, patents, translations, journal articles, etc. The documents themselves are ordered through Information on Demand's Fedlink contract and charged to the user's deposit account at the National Technical Information Service (NTIS). Users may also order translations of foreign language documents.

2.4 User Support

As soon as DTIC began prototyping DGIS, it was clear that user support was necessary. Even users testing the prototype system required hotline support, user documentation, training and a central point to coordinate similar questions. For this reason the Gateway User Support and Training Office (GUSTO) was established. GUSTO was run through a contract to Bolt Beranek and Newman. They answered user questions and created DGIS user documentation. Both end-user and intermediary user training sessions were held.

GUSTO answered user questions by several methods. The main DGIS menu screen and all DGIS literature listed the GUSTO hotline numbers, a local Washington, DC number and an 800 number. Users could also send questions or actual examples of problems through DGIS electronic mail to a special mail account called "dgishelp." To answer any question, GUSTO followed a hierarchical help procedure. The GUSTO staff members would answer routine queries themselves. If a more complex problem was presented, the staff members would check to see if they experienced the same problem. If not, they would question the user about what specific actions had been taken and possibly explain a misunderstanding of the software. If there was a real problem with the software, or a question was too technical for the GUSTO staff, they would forward the question to the System Manager for resolution. The System Manager would then either answer the questions or document a bug in the software for the technical staff. Similarly, GUSTO forwarded user requests for password or access changes to the System Manager.

Two DGIS commands also aided GUSTO in answering user questions. A DGIS user can interactively talk to any other user currently online with the DGIS "talk" command. This command can

2.7. Menus

The original menus were written using LLNL's IIS software. IIS was used because it was available at LLNL during the development period. However, by 1987, it had become obvious that IIS was inadequate for a production system. IIS was unsupported and was so patched that it was hard to maintain or modify. In addition menus created using IIS were hard to maintain due to IIS's unique programming language and structure. Moreover IIS could not perform a number of desired features and could not be modified to perform them without an extensive rewrite.

Rather than write a menu driver from scratch, it was decided to perform a market survey to see whether any software available could either meet the requirements or be easily modified to meet the requirements. We found that most menu software on the market was a subset of other pieces of software which we did not need, could not duplicate the structure of the current menus, or could not be modified for the required enhancements. In the end, we selected COSI's Visual Menus (VM) software, which was written using standard C and UNIX conventions, supported most of the required features, was available with a source code license, and was easily modified and maintained. (See Table I).

The VM software package was procured, modified, tested, and documented. The original DGIS software and enhancements were integrated into the new menu software.

2.8. Connection Agents

The DGIS technical staff modified the LLNL NAM software, which performs the automatic connection function, in a number of ways. These included providing a help menu, allowing DGIS to upload commands to databases, and adding an ability to transmit through a local area network.

Connection agents to remote resources were streamlined and modified as needed. New connection agents were added for Wilsonline, Questel, Infoline, and the European Space Agency database systems.

2.9. Other Activities

Besides software developments, other activities took place during this period to enhance DGIS. A Defense Data Network (DDN) interface was added to the computer system in order to send and receive electronic mail over the Internet. Users could also employ DDN to log into DGIS from a remote computer.

During 1988, DGIS was moved from the VAX 11/780 to a Pyramid 98X. The Pyramid held approximately 7 times the load as the VAX. Benchmarks were performed on the Pyramid system to determine the load characteristics of the DGIS software.

3.0 Transition

DTIC is organized with a development directorate (DTIC-E) separate from the operational directorates. DTIC-E, the Office of Information Systems and Technology, can only follow a project through the requirements, design and prototyping stages. After that, a system is transferred to the DTIC operational directorates, in this case to the Office of Telecommunication and ADP Systems (DTIC-Z) for the technical aspects and to the Office of User Services (DTIC-B) for registration, marketing, training, documentation, hotline, and other aspects of user support.

Transition of a system between directorates can be very complex. It was planned that the transition occur gradually, with DTIC-E slowly giving up its systems functions on DGIS while aiding the operational directorates to take over their mission-related tasks. Discussions of specific items for transition began in Oct 87, one year before the scheduled transition date in Oct 88. Monthly meetings were held among all participants to discuss progress in developments, problems, and strategies. These discussions were working level meetings of the development project officers and the liaisons from each operational directorate.

Policy issues were discussed between the directors of the appropriate organizations. The major issues were running the computer by contractor or government personnel, backup policy, pricing, internal registration procedures, transfer of maintenance, transfer of system manager duties, how continued development would proceed and be integrated, and whether DGIS would be relocated at Cameron Station. It was decided to keep DGIS at the development facility until a computer could be procured to run DGIS at Cameron Station. In the meantime, maintenance procedures and system administrator procedures would remain as they were. Development would continue separate from the operational DGIS until the new software could be thoroughly tested away from the impact of the users. Developments and integration would be coordinated with DTIC-Z.

4.0 Summary

DGIS is currently aiding a small user community to gain information from remote databases. The user base is growing as information about DGIS is spread by briefings at DTIC User Conferences and word of mouth. DTIC is gradually starting to move toward more aggressive marketing and to begin moving

GUSTO and system management in-house. Although staff
vacancies in some DTIC directorates have affected the transition
process, progress has been made in transitioning DGIS to the
operational directorates.

For example, The DTIC operational directorates have taken
over the budgeting process for the operational DGIS. Each
operational directorate sets policy and controls the portions of
DGIS that relate to its mission. A user registration procedure
has been established which will gradually move from the original
prototype period procedures to a formal registration database.
The results of all help calls are shared by all parties, both
user support and technical directorates, in order to make the
transition easier for all concerned.

In the meantime, DGIS development continues. The Common
Command Language is expected to be ready by Oct 89. Connections
to new databases are being created and post-processing is being
enhanced to allow for new output formats and processing. In
addition, DTIC is studying the possibility of obtaining master
accounts to remote databases and charging users back for their
usage. This effort, if successful, would avoid the necessity of
users obtaining their own accounts for all the databases.

Table I

Features required for Menu:

Written in C, run on UNIX 4.2+ BSD
Resemble present IIS menus
Have the capability to execute the present IIS C shell scripts
Still support dumb terminals even if limited and warn user of
  possibly limited capabilities
Handle screen display efficiently
Not represent a large load on the host
Support full accounting capabilities by user, TTY and command
Support an expert level of menus that can toggle back and forth
Content sensitive help
Select items by - numbers (not have to use .1 as in IIS)
Select items by - command names
Select items by - commands with arguments
Select items by - partial command menu (COPS program)
Documented
Maintainable and Portable
Support utilities for easy modification
Consistent interface
Capability to alter/save/read your environment
Capability to change directories
Command level security
Job control (more than one activity at once)

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